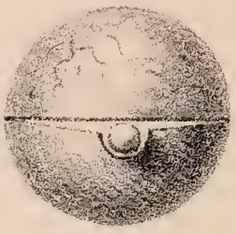
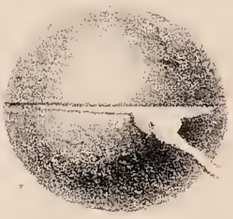
EYE OF MACKAREL.

Lateral Aspect.

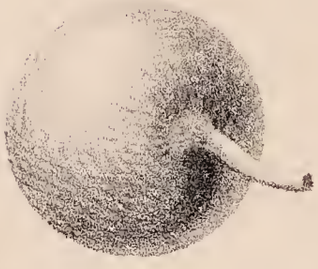
Lineal Slit.



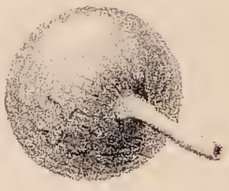
Posterior Aspect.



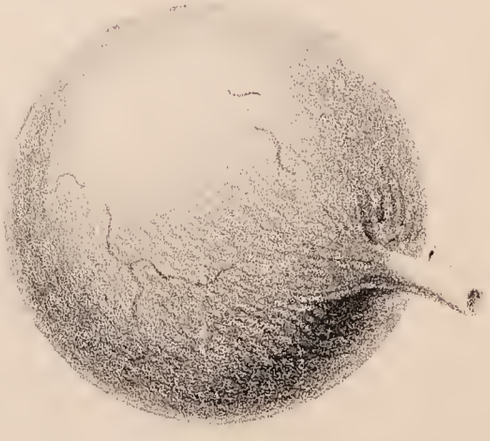
HADDOCK.



WHITING.



COD.



J.Basire.

POSTERIOR ASPECT IN ALL TO CONTRAST WITH MACKAREL

[*From the* Annals and Magazine of Natural History *for April* 1866.]

NOTES

ON

SOME PECULIARITIES

IN

THE EYE OF THE MACKEREL.

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[Plate VII.]

In the following observations it is not my intention to enter into any minute detail of the anatomical structure of the eye, but merely to notice some very striking and interesting peculiarities, different from the eye of any other fish which I have met with.

The eye of a fish, like the eye of all vertebrate animals, is constructed upon principles essentially similar, and presents the same coats and lenses as are met with in the human eye, and, generally speaking, arranged similarly. It, however, differs in many points of structure from that of terrestrial Vertebrata, its organization being, of course, adapted to the denser medium in which the fish resides, and so adapted as to bring the rays of light to converge at a shorter focus upon the retina. It is hence more globular or spherical, has always a very flattened form of bulb and a shorter axis, and is always covered by an investing fibrous membrane called the sclerotic coat. This is more or less thick and elastic; it is not, however, uniformly thick, being more so at the back of the eye than in front towards the cornea, in order, it is believed, to preserve the flatness of the cornea—an arrangement rendered necessary in all swimming animals, as well as fish, who reside constantly in

water, and who receive the rays of light through so dense a refractive medium. The sclerotic also varies in thickness in different fish; in the larger fish it is very thick, while in the generality of ordinary-sized fish it is very thin, soft, elastic, and flexible. In the Mackerel, however, instead of being soft, it is *uniformly firm, nay, entirely cartilaginous,* and would be inflexible but for its peculiar construction,—so much so that it retains its ordinary form, and with scarcely any diminution in size, if left unheeded to dry; whereas, in most other fish, the eye shrivels up, unless some distending medium (as cotton) is used to keep it in shape.

Again, in every fish which I have examined, the optic nerve penetrates the sclerotic coat by a round aperture, the coat *closely* encircling the nerve (see Pl. VII.: eye of Haddock, Whiting, and Cod); but in the Mackerel there is in this unyielding sclerotic coat a portion, as it were, cut out from the back of the eye, extending from near the opposite edges of the cornea, thus leaving, when in its quiescent state, an *elliptical* space, like two narrow cones joined at their bases (⋖⋗); but if the sides of the eye are pressed close, as they must be by the muscles when the focal distance is to be changed, it then becomes a mere line or slit.

There is a still further peculiarity in the Mackerel, viz. a small *semicircular notch* on the nasal side of this linear slit, in which the optic nerve lies secure from pressure in its passage through it. (See Plate.) It is, I believe, admitted that the adjusting power in the eye, in order to obtain distinct vision at different distances, is mainly dependent upon the flexibility of the sclerotic coat, which allows of its being compressed by the muscles, and thus, by the pressure of the humours, increasing the convexity of the cornea, while it also brings the retina closer to the posterior surface of the lens. Hence, in the greater number of fish, the sclerotic is soft and flexible, yet sufficiently firm to maintain its spherical shape. In a very few fish it is as hard as bone—in the sword-fish (*Xiphius gladius*), for example—and nearly inflexible; yet all of them possess the same adjusting-power. Amongst these the Mackerel has this peculiar formation: in this fish the eye would be nearly inflexible, from its hard cartilaginous nature; but by the very simple, yet beautiful, arrangement which I have described (of the elliptical slit), compression may be effected to any useful extent—thus accommodating the form of the eye to distances. The provision made to prevent pressure upon the optic nerve by this *notch* in the hard unyielding sclerotic will also be noticed. This notch clearly demonstrates not merely that, in this fish at least, the sclerotic is an investing membrane to preserve the form of the eye, but that

compression is produced to suit the focal distance; and if the compression were so great as to close the gap left in the sclerotic, it would, but for this notch, destroy, for a time at least, the optic nerve.

This singular and beautiful arrangement appears remarkably adapted to the habits of this fish. It is well known to be a very strong and rapid fish; it must therefore greatly facilitate it, in its rapid motions, in seizing its food, which it is believed it does by "striking across the course of what it supposes to be its flying prey,"—thus almost proving that its pursuit is more under the influence of sight than of taste or smell.

Couch, in his recent beautiful work, says that it will never attempt to seize that which seems without life; hence the object of the fishers is to cause the boat to be influenced by an amount of motion which shall resemble a living object. The boat must therefore be always under sail, and in a sufficient breeze to ensure any amount of success.